OPERATING MANUAL

model ERGO® 301

MICRO-TERM, INC.

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ERGO ® 301

OPERATING MANUAL

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MIME 740/ERGO 3001/ERGO 301 OPERATING MANUAL

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MIME 740/ERGO 3001/ERG0 301 OPERATING MANUAL

SECTION 0: INTRODUCTION

0.1 PRODUCT DESCRIPTION

The MIME ® 740/ERGO ® 3001/ERGO ® 301 is software compatible with the DEC VT100* with the advanced video option (VT1XX-AB) and printer port option (VT1XX-AC) as standard equipment. The unit also offers many features not available on the VT100. These features include:

1. Diagnostic and Transparency Modes - When enabled through Set Up C, diagnostic information is displayed on the 25th line and control codes are displayed for system analysis and program debugging.

2. Bi-Directional Printer Port - VT100 compatible printer port with full editing capability is standard. In addition, the unit's printer port is bi-directional for complete print capability.

3. Two Pages of Memory - Second page of memory in 80 column mode is standard.

4. Superior 132 Column Clarity - Extra dot separation plus a high resolution monitor generate the most readable 132 column display on the market.

5. Enlarged Buffer - 256 character buffer eliminates the possibility of losing data and reduces host overhead.

6. Screen Saver - Display shuts off after 9 minutes of non use. Depression of any key restores the screen without change.

7. Plain English Set-ups - Software set up switches defined in English allow the user to modify the terminal easily and without constant reference to manuals.

8. User Programmable Function Keys - In addition to 4 standard function keys, an additional 4 functions of up to 64 characters can be programmed by the user and saved in the terminal.

9. X-OFF Indicator - Alternately flashing ON LINE and LOCAL LEDs indicate that the operator has suspended transmission from the host.

10. Green Screen - High resolution green monitor is standard for a crisp display without eye fatigue.

*VT-100 is a registered trade mark of Digital Equipment Corporation.

Ø.2 USING THE unit OPERATING MANUAL

This manual is divided into three major sections providing 1) operator information, 2) programmer information, and 3) a group of appendices and tables for supplemental reference. Although operators will find the unit as easy to use as a typewriter, familiarity with section 1 allows the operator access to numerous selectable features designed to maximize personal comfort. To obtain full performance of the unit, the programmer should be thoroughly familiar with section 2. Knowledge of the many unit features enable the programmer to efficiently generate an effective display for any application.

Ø.3 INSTALLATION

The unit should be positioned on a steady surface and at a comfortable level for the user. A space of at least three inches must be provided at the rear of the unit to provide ease of access to the power switch. Care must be taken that magazines or other material do not fall behind the terminal and impede ventilation. The line cord must be connected to a three connector grounded AC source of the proper voltage. An environment which is comfortable to the user will generally be acceptable for the use and storage of the unit. Extremes of temperature and humidity must be avoided. Connect the unit to host using a 25 pin communications connector, and verify the pin connections in appendix 3.1.2. Turn on the power switch at the rear of the unit. Power on is definitively indicated by illumination of either the "ON LINE" or "LOCAL" lamp on the keyboard. The unit will perform the power up self tests and beep when ready. After a one minute warm up period for the display, the cursor should appear in the upper left position of an otherwise clear screen. The cursor is the blinking marker which indicates the position on the screen for the next character to be displayed. If any other display appears, refer to Section 3.2. Turn to section 1.3 and select the set up features appropriate to your particular application.

NOTE: The unit warms up with the display at a reduced size. During warm up, the display area will expand over a period of approximately 15 seconds to fill the entire screen. Please do not be alarmed at this warm up procedure as it is normal on each unit.

Ø.4 MAINTENANCE

External surfaces should be kept clean with the use of a mild soap or detergent solution on a damp cloth. Organic solvents must not be used. No other forms of preventive maintenance need be performed.

SECTION 1.Ø OPERATOR INFORMATION

1.1 INDICATORS

In addition to alphanumeric and graphic information displayed on the screen, the unit provides visual information via 7 lamps on the keyboard. Either the ON LINE lamp or the LOCAL lamp will be lit whenever the unit is operational. ON LINE signifies that characters typed at the keyboard will be transmitted to the host. LOCAL signifies that characters typed at the keyboard will be acted upon locally, but not transmitted to the host. While in local mode, the unit will not receive or process data sent by the host. Alternate flashing of the ON LINE and LOCAL lamps indicate that the operator has sent the "XOFF" code to the host, having typed Control S, or NO SCROLL. In most applications, receipt of XOFF will cause the host to suspend transmission to the unit until the code XON is received. (See Section 2.2.) The alternate flashing reminds the operator that the host is awaiting reactivation.

1.1.1 KBD LOCKED

Illumination of this indicator signifies that the transmit buffer is full, and no more characters will be accepted from the keyboard. This condition may occur if the host has prevented the unit from transmitting, or a fast typist is using the unit at a low transmit speed, such as 75 baud. The locked condition may be cleared by entering and exiting SET UP mode, provided that the original condition which caused the keyboard to lock (i.e., XOFF from the host) is also cleared after exiting SET-UP. If the original condition remains, the keyboard will very likely lock again until the limiting condition is cleared.

1.1.2 L1, L2, L3, L4

These four lamps are normally controlled by the host, and the significance of their status should be included within local procedures documentation. They are used under program control to notify the user of a certain program condition or status. (For more data, see Section 2.7.27.) In addition, L3 illuminates whenever the unit is in insertion mode (see Section 2.7.54).

1.1.3 ACCOUSTIC INDICATORS

Keyboard click is produced electronically and may be turned off or on at the discretion of the operator in SET UP mode B. When enabled, the click will be generated for each key depression which causes a code to

be transmitted. Two short "beeps" are sounded when the unit is first turned on and the power up self test is completed. A "beep-beep" is also sounded in response to the bell code from the host, and whenever the operator types to within eight character positions of the right margin when the margin bell feature has been enabled. A series of ten beeps upon power up, or when a recall (Section 1.3.9) operation has been initiated, signifies that an internal error has occurred while attempting to recall the SET UP features as they were last saved. If this condition should occur, the operator must correct the SET UP features and perform a save operation. See Section 1.3.10.

1.1.4 TUBE SAVER

When the unit has been inactive for 9 minutes, i.e., no transmission or reception has occurred, but power is applied, the screen will blank automatically to prolong the picture tube life. When new data is received, or the operator depresses any key, the screen is immediately restored. The key which restores the display is not transmitted. The tube saver feature is not active whenever the operator is in Set Up mode and may be selected or disabled by a programmable switch in Set Up Mode C.

1.2 KEYBOARD

The unit keyboard supports three key rollover which allows extremely fast typing speed and keystroke overlap. With three key rollover, if three keys are depressed, the terminal will process the first 2 keys in the order in which they were depressed and process the third key as soon as either of the other two are released. Except for this feature, the unit keyboard functions exactly as does a typewriter. The proper code associated with the key legend is transmitted each time a key is depressed. The shift key is used to send the upper case/shifted characters, and CAPS LOCK forces all alphabetic keys to be transmitted in upper case independent of the shift key. Non alphabetic keys must be shifted to obtain the upper case legend even if the caps lock is depressed. Keys which function other than to send the code associated with their legend are described below.

Please refer to Figure 1.2 on following page.

MIME 740/ERGO 3001

ERGO 301

FIGURE 1.2

1.2.1 CONTROL

When depressed simultaneously with another key, one of 32 non-displayable control codes will be transmitted (see Section 2.1.4).

1.2.2 ESCAPE

Transmits the Control Code for ESCAPE (1BH). Normally, this key introduces subsequent characters as special commands.

1.2.3 UP, DOWN, LEFT, RIGHT ARROWS

In LOCAL Mode, these keys will move the cursor in the direction indicated by the corresponding arrow. The cursor cannot be moved beyond the appropriate margin. In SET UP mode, the up and down arrow keys are used to adjust display brightness. When the unit is ON LINE, the host response to these keys may be application dependent.

1.2.4 f1, f2, f3, f4

These are special function keys for use ON LINE. Each key sends a unique code sequence to the host (see Section 2.1.6). Response to these keys is host application dependent.

When the operator depresses f1, f2, f3, or f4 while simultaneously depressing the "SHIFT" key, a previously stored message is transmitted to the host. The programmable function keys are normally used to transmit key sequences commonly encountered by the operator such as LOGON responses, directory requests, etc. Up to 64 characters may be defined for all 4 messages, and each message may contain from Ø to 63 characters. For information on programming these keys, please see Section 1.3.16.

In SET-UP Mode A, f1 and f2 are used to select between page 1 and page 2 when 2 page mode and 8Ø column format are enabled (see Section 1.3.11).

1.2.5 BACKSPACE

Transmits the control code for a backspace. In LOCAL Mode, the cursor will move horizontally toward the left margin.

1.2.6 NO SCROLL

This key is used to suspend transmission from the host allowing the operator time to review the display before it is replaced by new data. While transmission from the host is suspended, the ON LINE and LOCAL

lamps will alternately flash. Transmission from the host is resumed when the operator again depresses the NO SCROLL Key. This key function will perform as described only when the host supports an XON/XOFF protocol, and the unit is SET UP for Auto XON/XOFF (see Section 1.5.4).

1.2.7 BREAK

Forces the Break state to the host (see 2.1.1).

1.2.8 SET UP KEY

Used to enter and exit the SET UP mode. The SET UP mode enables special displays and keyboard functions to configure the unit for compatibility to the host and for maximum user comfort. Details for using the SET UP mode are found in Section 1.3 below.

1.2.9 ENTER/PRINT KEY

The "ENTER/PRINT" key transmits the codes indicated in Table 2.1.3 when depressed without the "SHIFT" or "CONTROL" modifier keys. "SHIFT ENTER/PRINT" causes the unit to perform a print page operation (see Section 2.7.64). "CONTROL ENTER/PRINT" causes the terminal to enter or exit the "AUTO PRINT" mode (see Section 2.7.61).

1.3 SET UP MODE

All switchable features of the unit are accessible from the keyboard in SET UP mode. The switch settings can be preserved upon command from the keyboard in an EAROM (Electrically Alterable Read Only Memory) within the unit. The EAROM maintains data integrity even when the power is off. Each time the unit is turned on, the switch settings are restored from the EAROM.

There are 3 set up modes - Set Up A, Set Up B, and Set Up C. Each is explained below.

1.3.1 SET UP A

The SET UP mode is entered by depressing the SET UP key. Data on the screen is preserved within the unit and restored when exiting SET UP mode by depressing the SET UP key again. The SET UP A display will appear similar to Figure 1.3.1 when the SET UP key is depressed. SET UP A shows each currently selected tab position as a T above the ruler at the bottom of the screen.

Set Up A also displays the page number on the screen when 2 page operation is selected.

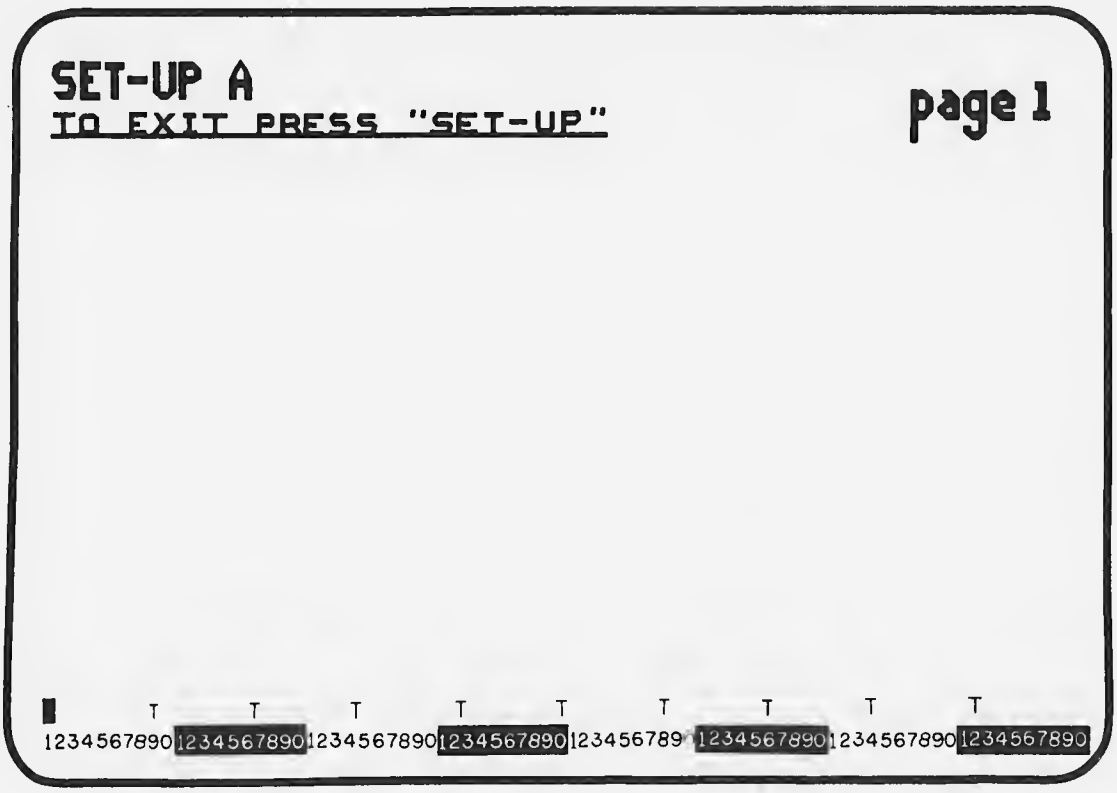


FIGURE 1.3.1

While in SET UP A Mode, the following functions may be performed.

1.3.2 CURSOR MOVEMENT

The cursor always remains above the ruler, but may be positioned horizontally by using the space bar, left and right arrow keys, tab, and the return key.

1.3.3 TABS

To set or clear a tab, position the cursor to the appropriate column and depress the 2/@ key. A "T" will appear or be erased to reflect the new tab status for that column. To clear all tabs, depress the 3/# key.

Default positioning of the tab stops at the ninth column and every eighth column thereafter is accomplished by depressing "SHIFT T".

1.3.4 INTENSITY

To change the intensity (brightness) of the display, use the up and down arrow keys. Each depression of the up arrow increases the intensity. The down arrow decreases the intensity. There are 32 levels of brightness.

1.3.5 LOCAL/ON LINE

The 4/$ key is used to change between LOCAL and ON LINE.

1.3.6 A=>B=>C=> MODE SELECT

The 5/% key is used to enter Set Up B from Set Up A, or Set Up C from Set Up B. Depression of this key will move the user alphabetically through the three set up modes with Set Up A entered upon depression of this key while in Set Up C.

1.3.7 DISPLAY FORMAT

The 9/(key changes the display format between 132 and 80 column mode. The change in display format is evidenced by the length of the ruler. Whenever the display format is changed, the dislay will be erased and the cursor will home up when returning to normal operation from the SET UP mode. Since the 2 page feature may only be used in 80 column mode, changing between 80 and 132 column format causes both pages to be erased, and page 1 to be selected.

1.3.8 RESET

The Ø/) key causes the unit to be reset, perform the self tests, and assume the SET UP features that were last saved in the EAROM. This is the same sequence as performed during power up.

1.3.9 RECALL SET UP FEATURES

R (upper case) causes the unit to RECALL the SET UP features that were last saved in the EAROM. The unit will respond about 1Ø seconds later with a beep. If five beeps are sounded, the unit is unable to verify the integrity of the data, and the operator must verify and reestablish the SET UP features individually. See Table 1 3.4 for the list of such features which may be saved and recalled from the EAROM.

Factory default values for all set-up features can be selected by depressing "SHIFT D".

1.3.1Ø SAVE SET UP FEATURES

Depression of Shift and S simultaneously initiates a SAVE operation causing the current SET UP features to be saved in the EAROM. Whenever the unit is powered up, or a recall function is performed, the SET UP features will match those features last saved in the EAROM. Whenever a save operation is performed, the "PRINTER TEST" and "DIAGNOSTIC MODE" bits are reset to "ZERO". After depression of these keys, a series of "PLEASE WAIT" messages will appear on the screen. After approximately 1Ø seconds, these messages will extinguish and the features have been saved.

1.3.11 PAGE SELECTION

When 2 page operation (see 1.11.3) and 8Ø column format are enabled, f1 and f2 select between page 1 and page 2 as indicated at the top of the SET-UP A display. Page selection is controlled by the operator or host, and each page maintains its own cursor position, character set definitions, and selection. The operator may choose the alternate page for use as a scratchpad, to save menus, instructions, or any other display for future reference without host intervention or display disruption. An example follows:

> The operator wishes to save a particular display for reference. Without clearing that display from the screen, the two page selection bit is enabled through SET UP C and SET-UP A is entered. (Page 1 should now appear in the top right corner of the screen.) The operator depresses "f2" to select page 2 and exits by depressing SET-UP. All of the data previously displayed on the screen is now stored in memory on page 1. Page 2 is now blank and the operator continues until it is desired to recall page 1. Once again SET-UP A is entered, f1 is depressed to recall page 1, and

SET-UP depressed to exit. The saved page 1 is now displayed. After reviewing page 1, the operator can restore page 2 by typing "SET-UP, f2, SET-UP".

The displays on page 1 and 2 are erased whenever the operator switches between 80 and 132 column mode or the "TWO PAGE OPERATION" bit in SET-UP C is changed.

NOTE: It must be remembered that the host receives no notification when the operator changes from page 1 to page 2. Hence, when changing pages, the operator must remember that the host is not aware of the page change and, therefore, cannot respond to both pages interactively.

1.3.12 SET UP B

When entering SET UP B Mode by depressing the 5/% key from SET UP A Mode, a display similar to Figure 1.3.2 will appear. In the SET UP B Mode, there are four groups of four switches which may be set or reset from the keyboard. To change a switch setting, position the cursor above the appropriate switch using the left and right cursor arrow keys, tab. return, or the space bar. Once the cursor is positioned, press the 6/^ key and observe that the switch toggles from 1 to 0 or 0 to 1 and the underline moves to the other definition. The function associated with the new switch setting is then appropriately adopted. Refer to Figure 1.3.3 to identify each switch, and to Table 1.3.4 for a complete description of each switch function. For example, to change the screen background, position the cursor directly above the third (left to right) switch in the first group. Depress the 6/^ key, and observe that the background reverses and the switch setting is changed. Switch settings will remain in effect until individually changed by the operator in SET UP mode, or remotely changed by the host, or the unit is reset. When power is turned on or a reset operation is performed, the SET UP features will match those which were last saved in the EAROM. To permanently save the SET UP features in the EAROM, a SAVE operation may be performed as described in SET UP A.

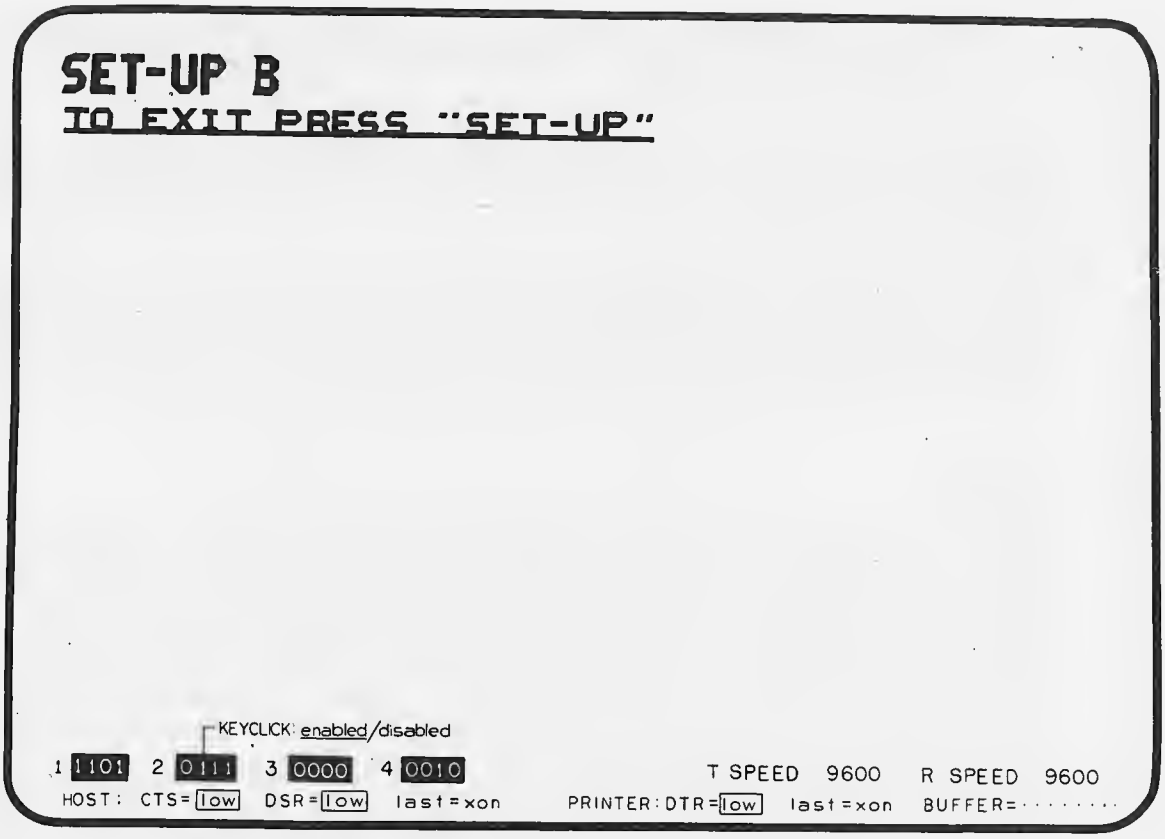


FIGURE 1.3.2

Other keys which have effect in SET UP B Mode are described on the next page.

1.3.13 TRANSMIT SPEED

7/& - each depression of this key causes the transmit data rate to be changed to the next standard value. The 13 standard values are 75, 110, 134.5, 150, 200, 300, 600, 1200, 2000, 2400, 4800, 9600, and 19,200 baud. The currently selected value appears on the display.

1.3.14 RECEIVE SPEED

8/* - This key is used to change the receive data rate. See 7/& above.

1.3.15 ANSWER BACK MESSAGE

A (upper case) - is used to set the Answer Back message. The unit will respond by displaying "A = " on the display. The first character entered by the operator is the message delimiter character. The

character will be displayed, but is not actually part of the message. After the message is entered and the delimiter is typed again, the answer back message is terminated and will disappear from the display. Control codes (ØØH-1FH) may be part of the message. All control codes should be produced by using the control key and the appropriate alphabetic key. Specifically, to include the control code for "return", use CONTROL "M", not the RETURN key. When programming the answer back message, control codes are represented in reverse video by the corresponding upper case character which has the same lower 5 bits and preceded by "^". For example, "RETURN" or CONTROL "M" is represented as "^M". The message may consist of up to 2Ø characters, and is terminated upon receipt of the 2Øth character, or the delimiter character. If an error is made when preparing the answer back message, type the delimiter character and start again by typing A. To permanently store the prepared answer back message, perform a SAVE operation.

Other keys which have an effect in SET UP B Mode similar to SET UP A Mode include:

4/$ - Toggles between ON LINE and LOCAL.

5/% - Toggles between SET UP A, B, and C Modes.

Up Arrow, Down Arrow - Adjusts screen brightness.

1.3.16 PROGRAMABLE FUNCTION KEYS

The 4 user-definable function keys are programmed in SET-UP mode "B" by depressing "SHIFT fx" (x = 1-4). The unit responds by displaying the current key definition with control codes represented by "^" followed by the associated displayable character in reverse video. For example, "RETURN" is displayed as "^M". The operator may then exit by depressing "SET-UP", go on to review other function keys by depressing Shift Fx, or redefine the key displayed. In order to redefine a function key, depress Shift + fx (x=1-4) while in Set Up B. For example, Shift + f1 will display f1 = (Message). To change the message or character string, type any character to act as a delimiter to begin the new message string. The unit will accept up to 63 characters as a message string, and will stop accepting characters when a second delimiter character is typed. For example, if the message string is STOP followed by a bell, one might type ".STOP [CTRL] G.", in order to store the message. In this example, the periods are message delimiters, and the message string will appear as "STOP ^G". Each definition may be up to 63 characters in length, and contain any of the 128 ASCII codes except the delimiter. The total number of characters available for all four function keys is 64, therefore, a key definition will be automatically terminated if the operator attempts to exceed that length.

In case of error, the operator may exit from programming the function key by depressing Set-Up or Shift Fx without disturbing the previous

key definition. The new definition is not adopted until the operator strikes the delimiter key for the second time. To permanently store the new function key definition, perform a "SAVE" operation.

1.3.17 SET UP FEATURE SUMMARY

Set up features are summarized below in two groups. The first group consists of those features that must be correctly set for the unit to function properly in a particular environment defined by the power source, computer interface, printer interface, and software of the host. The second group consists of those features which may be arbitrarily changed by the operator to maximize personal comfort.

TABLE 1.3.4 SWITCHES SAVED IN EAROM

SETTINGS CONSTRAINED BY HOST ENVIRONMENT

FEATURE	SET UP MODE	KEY TO CHANGE FEATURE
ANSI/VT52	B	6/^
ANSWER BACK MESSAGE	B	A + Special Sequence
AUTO X-ON/X-OFF	B	6/^
BITS PER CHARACTER	B	6/^
CHARACTERS PER LINE	A/B	9/(
ECHO	C	6/^
LINE/LOCAL	A/B	4/$
NEW LINE	B	6/^
NUMBER SIGN/BRITISH POUND SIGN	B	6/^
PARITY	B	6/^
PARITY SENSE	B	6/^
POWER	B	6/^
PRINTER BITS PER CHARACTER	C	6/^
PRINT EXTENT	C	6/^
PRINTER => HOST	C	6/^
PRINTER SPEED	C	7/&, 8/*
PRINTER PARITY	C	6/^
PRINTER PARITY SENSE	C	6/^
PRINT TERMINATION	C	6/^
RECEIVE SPEED	B	8/*
SCROLL	B	6/^
TABS	A	3/#, 2/@ + CURSOR POSITION
TRANSMIT SPEED	B	7/&
WRAP AROUND	B	6/^

SETTINGS FOR OPERATOR CONVENIENCE

The unit contains English set ups for the convenience of the operator. With this feature, it is no longer necessary to refer to a chart to determine these switches available in Set Up B. To use this feature, position the cursor over any of the 16 blocks available in Set Up B, or 12 blocks available in Set Up C, and read the switch setting immediately to the right of the cursor. The operator may also determine the switch setting by noting the underlined attribute. To change settings, merely depress the 6/^ key while the cursor is positioned above the attribute in question.

FEATURE	SET UP MODE	KEY TO CHANGE FEATURE
INTENSITY	A/B	UP ARROW DOWN ARROW
AUTO REPEAT	B	6/^
BACKGROUND	B	6/^
CURSOR	B	6/^
KEY CLICK	B	6/^
MARGIN BELL	B	6/^
RESET	A/B	Ø
SCREEN SAVER	C	6/^
SCROLL	B	6/^
SMOOTH SCROLL SPEED	C	6/^
TWO PAGE OPERATION	C	6/^

NOTE: All features changed by the 6/^ key must have the cursor properly positioned.

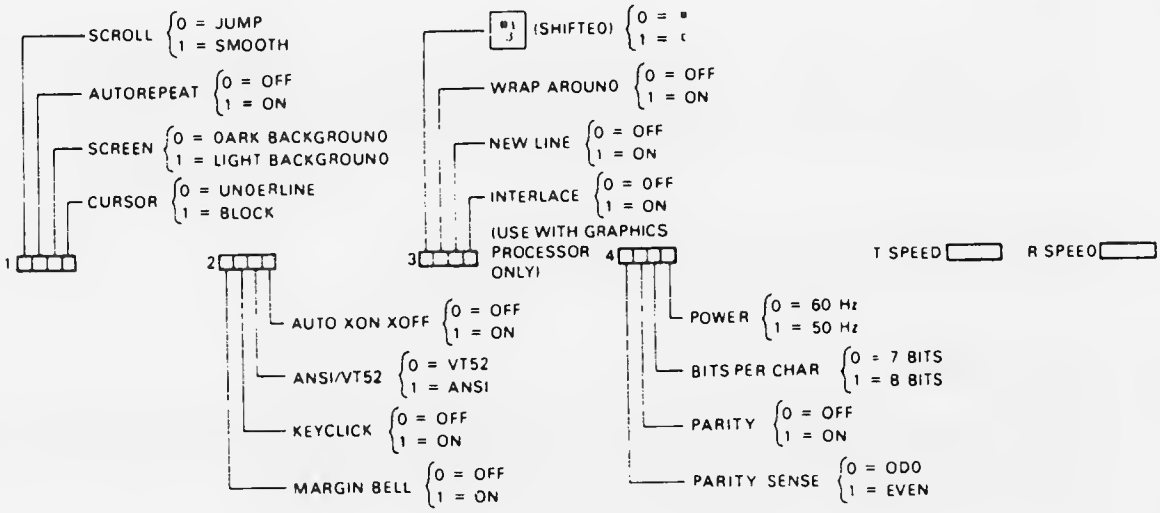


FIGURE 1.3.3

1.4 DESCRIPTION OF SET UP B SWITCHES - GROUP ONE

1.4.1 SCROLL

Scrolling is the vertical movement of the display to make room for new lines at the top or bottom. When set for Jump Scroll (switch = Ø), the display "jumps" one full character row at a time upon command from the host. When the host causes a rapid succession of jump scrolls, the display may be difficult to read. Smooth Scroll (switch = 1) limits the number of scrolls to six or twelve per second (depending on the number chosen in Set Up C — see Section 1.11.4), and the vertical movement occurs at a steady rate. To insure that no data is lost when smooth scroll is enabled, the unit and host should be synchronized by selecting the Auto XON feature which must be supported by the host.

1.4.2 AUTO REPEAT

When enabled (switch = 1), this feature allows the key to automatically repeat at about 3Ø characters per second after the key has been held down for more than one half second. The following keys do not auto repeat: SET UP, BREAK, NO SCROLL, TAB, RETURN, ENTER, and any other key when CONTROL is depressed.

1.4.3 SCREEN

When enabled (switch = 1), this feature produces a light background with dark characters. When the switch is set to Ø, light characters appear upon a dark background.

1.4.4 CURSOR

When enabled (switch = 1), the cursor appears as a block marker. When the switch is set to Ø, the cursor appears as an underline marker. The cursor always blinks for easy identification.

1.5 DESCRIPTION OF SET UP B SWITCHES - GROUP TWO

1.5.1 MARGIN BELL

When enabled (switch = 1), a "beep-beep" will sound whenever the operator types to the eighth character position from the right margin. The margin bell is disabled when the switch equals Ø.

1.5.2 KEY CLICK

When enabled (switch = 1), a click will be sounded with each key stroke that generates a code from the unit. The click is disabled when the switch equals Ø.

1.5.3 ANSI/VT52

The unit can respond to escape sequences according to two different standards. The two different modes of response are named ANSI and VT52 for historical reasons. Refer to the Programmer's Section of this manual for a complete description of the unit response in each mode. When enabled (switch = 1), the ANSI standard is selected. When the switch equals Ø, the VT52 standard is enabled. The switch must be set appropriately for the software of the host.

1.5.4 AUTO XON/XOFF

Selection of this feature enables the unit to automatically send the synchronizing codes XOFF and XON to suspend and continue transmission from the host. Since proper operation of this feature requires timely cooperation from the host, be sure that the XON/XOFF protocol is supported by the host when this feature is enabled (switch equals 1).

When AUTO XON/XOFF is enabled, the unit will send XOFF in any of the following circumstances:

1. The internal buffer is nearly full;
2. No Scroll key is depressed;
3. The unit is placed in Set Up Mode;
4. Control S is typed.

XON is automatically transmitted when the buffer empties, the No Scroll key is depressed again, an exit is made from Set Up Mode, or Control Q is typed. See also Section 2.1. When the operator causes XOFF to be sent, the On Line/Local lamps will alternately flash until XON is sent by the operator. When the auto XON/XOFF feature is not enabled (switch equals Ø), XOFF and XON will only be transmitted when the operator types Control S and Control Q.

1.6 DESCRIPTION OF SET UP B SWITCHES - GROUP THREE

1.6.1 POUND CHARACTER

- The character sets for the United States and the United Kingdom differ by one character, the "#" or British Pound " £ " symbol. When the switch is set (1), the UK Pound symbol is used. When the switch is

Ø, the U.S. pound symbol is used.

1.6.2 WRAP AROUND

When enabled (switch = 1), an attempt to overfill a line will cause the offending character to be placed at the first position on the next line down. If the switch equals Ø, any attempt to overfill a line will cause the character to override the rightmost display position of the same line.

1.6.3 NEW LINE

When the new line mode is selected (switch =1), depression of the RETURN key will cause the codes for carriage return (CR) and line feed (LF) to be transmitted. When a line feed code is received, a carriage return and line feed function are performed. When the new line mode is reset (switch = Ø), the RETURN key transmits only carriage return, and receipt or the line feed code causes only the line feed function to be performed.

1.7 DESCRIPTION OF SET UP B SWITCHES - GROUP FOUR

When the selection has been made for 8 data bits and no parity, the eighth transmitted data bit takes on the sign of the parity sense bit selected in SET UP B for the I/O channel and SET UP C for the printer channel.

1.7.1 PARITY SENSE

If parity has been enabled, the switch determines which method of parity checking will be employed by the unit. When the switch equals 1, even parity is calculated. When the switch equals Ø, odd parity is generated with each transmitted character and verified against each received character. If the received character does not have the proper parity, the character will be rejected and a checkerboard pattern is displayed. If 8 data bits and no parity have been selected, the eighth transmitted bit (MSB) takes on the sign of the PARITY SENSE bit (1 = mark).

1.7.2 PARITY

When enabled (switch = 1), the unit will include a parity bit with each transmitted character and verify the parity of each received character. When parity is enabled, parity sense must be properly set to select even or odd parity.

1.7.3 BITS PER CHARACTER

This feature allows the unit to transmit and receive either seven or eight bits per character. Eight bit operation is selected when the switch equals 1. When eight bits are transmitted, the eighth bit is sent as a logical Ø. If 8 data bits and no parity have been selected, the eighth transmitted bit (MSB) takes on the sign of the PARITY SENSE bit (1 = mark). During reception, the eighth bit is ignored.

1.7.4 POWER

The display refresh of the unit must be matched to the power line frequency. In the U.S. this switch must be set for 6Ø Hz (switch = Ø). For other power sources of 5Ø Hz, the switch must be set to 1.

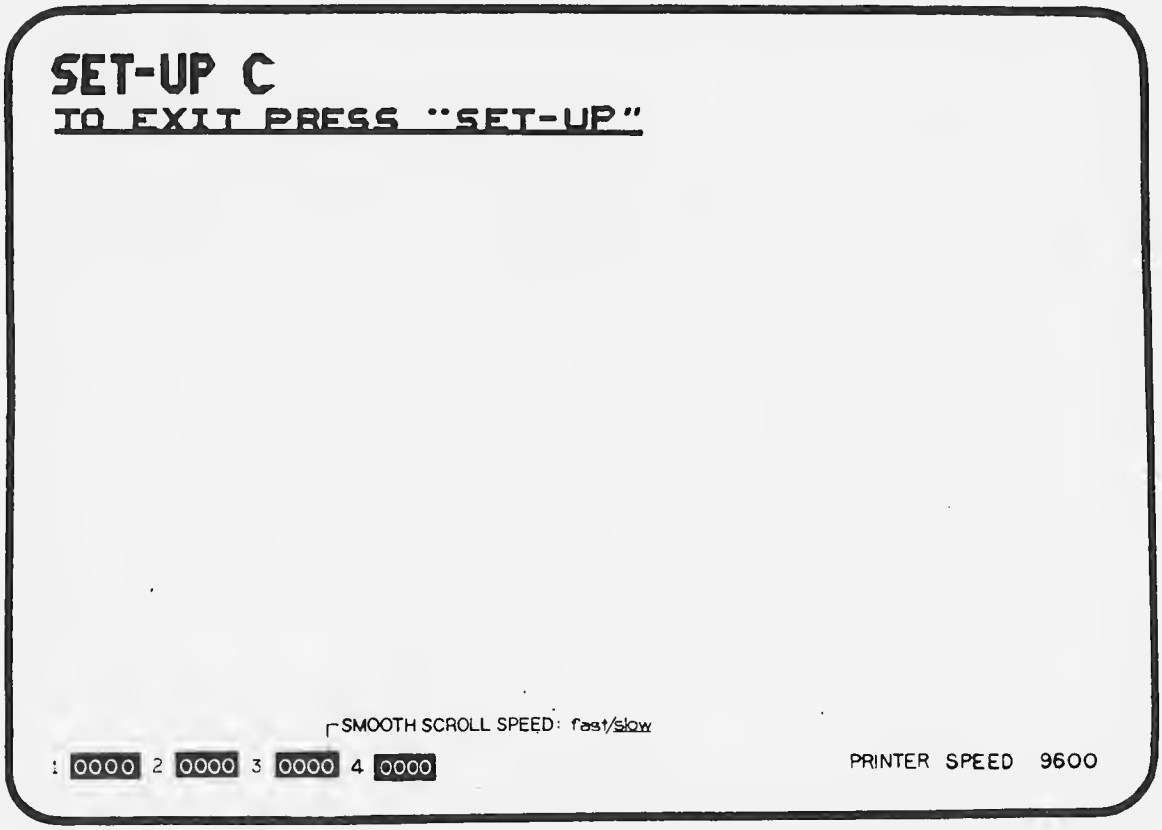


FIGURE 1.8.1 SET UP C

1.8 SET UP C

1.8.1 SET UP Mode "C" is entered by depressing SHIFT 5/% from SET-UP Mode "B". The SET-UP "C" display includes 3 groups of 4 switches. The "switches" are toggled as in SET-UP mode "B". The cursor is positioned horizontally to the appropriate switch and the 6/^ key is used to toggle the switch. The switch definition and selected position are described above the switch. The SET-UP "C" settings may be permanently stored by performing a "SAVE" operation. To exit SET-UP "C" mode to SET-UP "A" mode, depress the 5/% key.

1.8.2 To change the printer speed, use the 7/& or 8/* key. Each keystroke selects the next one of 13 speeds. The display indicates the printer serial baud of 50, 75, 110, 134.5, 150, 300, 600, 1200, 2400, 4800, 7200, 9600, or 19,200. Transmit and receive rates for the printer are the same.

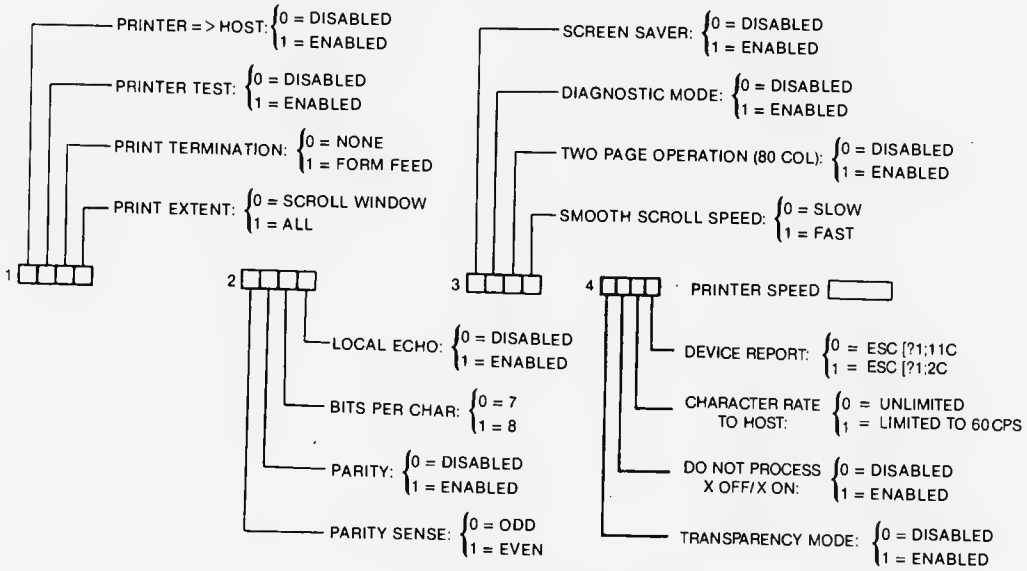


FIGURE 1.8.2 SET UP C SWITCHES

1.9 DESCRIPTION OF SET UP C SWITCHES - GROUP ONE

1.9.1 PRINTER => HOST

When enabled, the unit printer port becomes bidirectional and will route all data received from the printer port to the host except XON and XOFF. When disabled, this switch causes all data except XON and XOFF from the printer to be ignored. This feature is used when the printer contains a keyboard and the operator desires to communicate to the host from the printer. XON and XOFF are not passed directly to the host and are used instead to control transmission between the unit and the printer. (This feature will normally be used in conjunction with the auto print mode or printer controller mode described in Section 2.7.61 and 2.7.62.)

1.9.2 PRINTER TEST

When this switch is enabled, data from the keyboard is transmitted to the printer for testing the printer channel, printer top of form, tab settings, etc. This switch cannot be saved in the enabled position.

1.9.3 PRINT TERMINATION

When the switch is enabled, a "form feed" (OCH) will terminate each "print page" operation.

1.9.4 PRINT EXTENT

This switch signifies that the entire page (switch = 1) or only the scrolling window (switch = Ø) constitute the lines to be printed by a "print page" command.

1.1Ø DESCRIPTION OF SET UP C SWITCHES - GROUP TWO

1.1Ø.1 PARITY SENSE

If parity has been enabled, this switch determines which method of parity checking will be employed by the unit on the printer port. When the switch equals 1, even parity is calculated. When the switch equals Ø, odd parity is generated with each transmitted character to the printer and verified against any received characters from the printer. If the received character does not have the proper parity, the character is ignored. If 8 data bits and no parity have been selected, the eighth transmitted bit takes on the sign of the PARITY SENSE bit.

1.10.2 PARITY

When enabled (switch = 1), the unit will include a parity bit with each transmitted character to the printer and verify the parity of each received character from the printer. When parity is enabled, parity sense must be properly set for even or odd parity.

1.10.3 BITS PER CHARACTER

This switch allows the unit printer port to transmit and receive either seven or eight bits per character. Eight bit operation is selected when the switch equals 1. When eight bits are transmitted, the eighth bit is sent as a logical Ø when parity is enabled. With no parity and 8 bits selected, the eighth bit takes on the sign of the PARITY SENSE switch. During reception, the eighth bit is ignored.

1.10.4 ECHO MODE

When enabled (switch equals 1), all characters which are transmitted by the unit to the host are also processed locally.

1.11 DESCRIPTION OF SET-UP C SWITCHES - GROUP THREE

1.11.1 SCkEEN SAVER

With this switch enabled, the screen will automatically blank after 9 minutes of inactivity. The display will be restored upon receipt of any data from the host or depression of any key by the operator. A key depression which restores the display does not cause any code to be transmitted or the character to be displayed.

1.11.2 DIAGNOSTIC MODE

Diagnostic mode provides the programmer or system manager with display tools for monitoring all significant control lines, the last received XON/XOFF status for the host and printer channels, and input buffer "fullness".

When the diagnostic mode is enabled, the 25th display line identifies the control lines and statistics to be monitored. Actual monitoring begins when the user exits from SET-UP mode. "DSR" monitors pin 6 and "CTS" monitors pin 5 of the I/O (host) connector indicating "high" when the lines are in the asserted state, and "low" when not asserted or disconnected. During normal full duplex operation, the DSR and CTS levels are not significant for proper operation. The last protocol character received, XON or XOFF indicates whether the unit is able to

transmit (XON last received) or has been prevented by the host from transmitting (XOFF last received). Similar indicators exist for the printer channel for which DTR (see 3.1.3) is monitored. The unit is prevented from transmitting to the printer whenever DTR is low. The display at the right side of line 25 indicates input buffer "fullness" in bar graph format. There are 8 positions which fill from left to right as the buffer becomes more full. When the first position fills, there are between 1 and 31 characters in the buffer. For each additional 32 characters in the buffer, the bar graph moves one position to the right. When the input buffer contains 160 or more characters, the bar graph appears in reverse video with blink to emphasize that there may be a protocol problem, i.e., either auto XON/XOFF is not enabled or the host is not responding to XON/XOFF. If the buffer overflows, a crosshatch symbol is inserted in the data stream. To test adherence to the XON/XOFF protocol, smooth scroll must be selected while in diagnostic mode. When performing a "SAVE" operation, diagnostic mode is disabled.

1.11.3 TWO PAGE OPERATION

When enabled, two page operation allows the operator to select either of two pages in 80 column mode to be the active page while saving the other page for reference. The active page is identified in SET-Up mode "A" and selected by depressing either F1 or F2. When changing between 80 and 132 column mode, or changing the status of the 2 page operation switch, both pages are cleared and page 1 is selected. See Section 1.3.11.

1.11.4 SMOOTH SCROLL SPEED

The operator may choose between 2 smooth scroll speeds. "Slow" scroll moves the display vertically at a maximum rate of 6 lines per second. "Fast" smooth scroll allows a rate of 12 lines per second.

1.12 DESCRIPTION OF SET-UP C SWITCHES - GROUP FOUR

1.12.1 TRANSPARENCY MODE

For software debugging, transparency mode allows the display of all data from the host including control and escape sequences. Control codes are displayed in reverse video as "^" followed by the displayable character which has the same lower 5 bits as the control code in question. For example, "ESCAPE" is displayed as "^[".

When the operator leaves transparency mode, a cross hatch symbol will be placed after the last character displayed while in diagnostic mode. When performing a "SAVE" operation, transparency mode is disabled.

1.12.2 IGNORE "XOFF/XON" FROM HOST

When enabled, the unit will ignore "XOFF" (CONTROL "S") and "XON" (CONTROL "Q") from the host which would normally suspend and enable the transmission from the unit to the host. The switch setting may be saved in the EAROM and facilitates operation of the unit under some non-DEC operating systems, notably IBM and HEWLETT-PACKARD.

1.12.3 CHARACTER RATE TO HOST

Normally, the unit will transmit data as rapidly as possible, limited only by the transmit baud rate. Numerous reports, the cursor keys, function keys, and the numeric keypad in application mode send multiple character sequences which can be lost by the host if the host operating system was designed only to accept characters at human typing speed. Typically, this situation occurs with multiuser or time sharing systems which employ a single processor for all operations. When used on such a system, the unit can limit the transmitted character rate to 60 characters per second by enabling this switch.

1.12.4 DEVICE (ATTRIBUTES) REPORT

In response to a host request for a DEVICE REPORT (ANSI mode), the unit can send either of two sequences. "ESC[?1;1c" is the accurate report indicating that the terminal posesses printer port and editing capability. "ESC[?1;2c" indicates no printer port or editing ability. Some older versions of popular software, notably "TECO" expects the latter device report and may display errant "c's" when the former (accurate) report is given.

SECTION 2.Ø PROGRAMMER INFORMATION

2.1 KEYBOARD

The keyboard produces the standard ASCII codes associated with each key legend. A summary of the ASCII codes appears in Section 3.3. All keys which are "programmable", or may send non-standard codes, are described below.

2.1.1 BREAK

Forces the output channel from the unit to the host into the space state for .232 seconds. When the BREAK key is depressed simultaneously with the shift key, the space state is held for 3.5 seconds, to provide the long break/disconnect modem signal. Simultaneous depression of the CTRL and BREAK keys causes the answer back message to be transmitted.

2.1.2 NO SCROLL

This key alternately sends XOFF and XON when the auto XON and XOFF feature has been selected enabling the operator to suspend transmission from the host. See Sections 1.2.6, 1.5.4, 2.2.

2.1.3 RETURN

This key may send a single code for RETURN (ØDH) or RETURN and LINE FEED (ØDH, ØAH) depending on the setting of the new line feature. See Section 1.6.3. The host can control the setting of the new line feature with a Set/Reset sequence when in operating in ANSI Mode.

2.1.4 KEYBOARD GENERATION OF CONTROL CODES

Table 2.1.1 indicates the keys required to generate the 32 ASCII control codes. Control combinations not listed in the table cause the null code to be transmitted.

KEYBOARD GENERATION OF CONTROL CODES

Key Pressed With CTRL Key Down (Shifted or Unshifted)	Hex Code Transmitted	Function Mnemonic
Space Bar	ØØH	NUL
A	Ø1H	SOH
B	Ø2H	STX
C	Ø3H	ETX
D	Ø4H	EOT
E	Ø5H	ENQ
F	Ø6H	ACK
G	Ø7H	BEL
H	Ø8H	BS
I	Ø9H	HT
J	ØAH	lF
K	ØBH	VT
L	ØCH	FF
M	ØDH	CR
N	OEH	SO
O	ØFH	SI
P	1ØH	DLE
Q	11H	DC1 or XON
R	12H	DC2
S	13H	DC3 or XOFF
T	14H	DC4
U	15H	NAK
V	16H	SYN
W	17H	ETB
X	18H	CAN
Y	19H	EM
Z	1AH	SUB
[	1BH	ESC
\	1CH	FS
]	1DH	GS
~ (`)	1EH	RS
? (/)	1FH	US

TABLE 2.1.1

2.1.5 CURSOR CONTROL KEYS

The four arrow keys will transmit three different sequences, depending on the current state programmed into the unit. Table 2.1.2 summarizes the possible cursor control key sequences.

Cursor Key (Arrow)	VT52 Mode	ANSI Mode with Cursor Key Mode Reset	ANSI Mode with Cursor Key Mode Set
Up	ESC A	ESC [A	ESC O A
Down	ESC B	ESC [B	ESC O B
Right	ESC C	ESC [C	ESC O C
Left	ESC D	ESC [D	ESC O D

TABLE 2.1.2

2.1.6 AUXILIARY KEYPAD

The rightmost 18 keys constitute the Auxiliary Keypad. Codes sent from the Auxiliary Keypad depend upon the key, whether the terminal is in ANSI or VT52 mode, and whether the Auxiliary Keypad numeric mode or the Auxiliary Keypad application mode is in effect. The appropriate keypad code sequences are listed in Table 2.1.3. None of the keys in the Auxiliary Keypad are Affected by CAPS LOCK or CONTROL, and only f1 through f4 are affected by SHIFT (see Section 1.2.4).

NOTE: To enter or exit the Application mode, see Sections 2.7.25 and 2.7.26.

AUXILIARY KEYPAD CODES

Key	VT52 Keypad Numeric Mode	VT52 Keypad Application Mode	ANSI Keypad Numeric Mode	ANSI Keypad Application Mode
Ø	Ø	ESC ? p	Ø	ESC O p
1	1	ESC ? q	1	ESC O q
2	2	ESC ? r	2	ESC O r
3	3	ESC ? s	3	ESC O s
4	4	ESC ? t	4	ESC O t
5	5	ESC ? u	5	ESC O u
6	6	ESC ? v	6	ESC O v
7	7	ESC ? w	7	ESC O w
8	8	ESC ? x	8	ESC O x
9	9	ESC ? y	9	ESC O y
-	-	ESC ? m	-	ESC O m
,	,	ESC ? l	,	ESC O l
.	.	ESC ? n	.	ESC O n
ENTER	Same as [RETURN]	ESC ? M	Same as [RETURN]	ESC O M
F1	ESC P	ESC P	ESC O P	ESC O P
F2	ESC Q	ESC Q	ESC O Q	ESC O Q
F3	ESC R	ESC R	ESC O R	ESC O R
F4	ESC S	ESC S	ESC O S	ESC O S

TABLE 2.1.3

2.1.7 KEYBOARD DISABLE

The programmer may restrict keyboard transmission by controlling the auto repeat capability with ANSI SET/RESET sequences, or by disabling transmission completely from the unit with the XOFF control code. While disabled from transmitting, the unit may still send the synchronizing codes XON and XOFF to the host as necessary. Although no characters will be transmitted from the keyboard, up to six characters may be buffered. When the buffer fills, the keyboard locked lamp will illuminate, and further keyboard activity will be ignored. The keyboard will unlock when transmission to the host is resumed due to receipt of XON code and subsequent emptying of the keyboard buffer, or due to entering SET UP Mode. The SET UP key, since it functions locally, is not disabled when the keyboard locked lamp is on. Entering SET UP clears the keyboard buffer immediately. The keyboard buffer may fill as evidenced by the keyboard locked lamp even when the host has not sent XOFF if the operator is typing faster than the channel capacity. This circumstance is probable only when the transmission rate is 75 baud.

2.2 XON/XOFF PROTOCOL

The unit can receive data at speeds up to 19,200 baud. Since some control sequences cannot be executed as quickly as they may be received, the incoming data is buffered and processed on a first in first out basis. To prevent the possibility of buffer overflow, the unit sends XOFF to the host when the 256 character buffer becomes half full, and then sends XON when only 32 characters remain in the buffer if the auto XON/XOFF feature has been enabled. The host must promptly suspend transmission upon receipt of XOFF until XON is received. To calculate the maximum time available to the host to suspend transmission, use the following formulas:

Number of Characters to Overflow: N = 128 - [3 X (receive/transmit speed)]

Time to Respond to XOFF = N X (bits/character + x + y)/receive speed

Where x = 0 parity disabled; 1: parity enabled
Where y = 2 for receive speed > 110; 3 otherwise

This is a worst case calculation. Some additional time is available to the host as characters are removed from the buffer and processed. For a quick calculation, the time to respond to XOFF can be approximated to within a factor of 2 by 1,000/receive speed (seconds). For example, at 19,200 baud, the host should respond within 50 miliseconds.

Software which does not support the XON/XOFF protocol can still use the unit provided that smooth scroll is not enabled and the printer port is not used.

2.3 SPECIAL GRAPHICS

When "Special Graphics" character set is selected, the display representation for the hex codes 5F through 7E will appear according to Table 2.3.1.

SPECIAL GRAPHICS

Hex Code	US or UK Display	Special Graphics Display	Hex Code	US or UK Display	Special Graphics Display
5FH	_	Blank	6FH	o	Horiz. Line-Scan 1
60H	\	♦ Diamond	70H	p	Horiz. Line-Scan 3
61H	a	▒ Checkerboard	71H	q	Horiz. Line-Scan 5
62H	b	␉ Horizontal Tab	72H	r	Horiz. Line-Scan 7
63H	c	␌ Form Feed	73H	s	Horiz. Line-Scan 9
64H	d	␍ Carriage Return	74H	t	├ Left "T"
65H	e	␊ Line Feed	75H	u	┤ Right "T"
66H	f	° Degree Symbol	76H	v	┴ Bottom "T"
67H	g	± Plus/Minus	77H	w	┬ Top "T"
68H	h	␤ New Line	78H	x	│ Vertical Bar
69H	i	␋ Vertical Tab	79H	y	≤ Less Than/Equal To
6AH	j	┘ Lower-Right Corner	7AH	z	≥ Greater Than/Equal To
6BH	k	┐ Upper-Right Corner	7BH	{	π Pi
6CH	l	┌ Upper-Left Corner	7CH	|	≠ Not Equal To
6DH	m	└ Lower-Left Corner	7DH	}	£ UK Pound Sign
6EH	n	┼ Crossing Lines	7EH	~	· Centered Dot

TABLE 2.3.1

2.4 OPERATING MODES

The unit operates in either VT52 or ANSI modes. The two modes differ principally by the response to escape sequences, i.e., commands from the host which begin with the codes ESC. Operation in VT52 mode allows the unit to be compatible with the large wealth of existing software written for a VT52 environment. In the ANSI mode, the unit responds to a subset of ANSI X3.41-1974 and X3.64-1977 which are expected to become the predominant format for terminal command sequences. New software should be written to operate in ANSI mode. Terminal commands for ANSI and VT52 modes are listed in Section 2.7 and 2.8 respectively.

2.5 CONTROL CODE RESPONSE

The unit responds to Control Codes (ØØH-Ø1FH) identically in both VT52 and ANSI modes. The responses are listed in Table 2.5.1. Control Codes may be embedded within Escape sequences, and will be processed as soon as they are encountered by the unit.

CONTROL CODE RESPONSE

CONTROL CHARACTER	HEX CODE	unit RESPONSE ANSI OR VT52 MODE
NUL	ØØH	Ignored
ENQ	Ø5H	Transmit answerback message.
BEL	Ø7H	Sound bell tone.
BS	Ø8H	Move the cursor to the left one character position, unless it is at the left margin, in which case no action occurs.
HT	Ø9H	Move the cursor to the next tab stop, or to the right margin if no further tab stops are present on the line.
LF	ØAH	This code causes a line feed or a new line operation. (See Section 1.6.3)
VT	ØBH	Interpreted as LF.
FF	ØCH	Interpreted as LF.
CR	ODH	Move cursor to left margin on the current line.
SO	OEH	Select Gl character set, as defined by "ESC)" sequence.
SI	OFH	Select GØ character set, as defined by "ESC(" sequence.
XON	llH	Causes terminal to resume transmission.
XOFF	13H	Causes terminal to stop transmitting all codes except XOFF and XON.
CAN	18H	If sent during an escape or control sequence, the sequence is immediately terminated and not executed.
SUB	lAH	Interpreted as CAN.
ESC	lBH	Introduces an escape sequence.

TABLE 2.5.1

2.6 ANSI FORMAT

NOTE: A brief but restricted description of the ANSI format applicable to the unit follows. Completeness and generalization have been sacrificed in deference to expedience in discussing the standard in order to provide only the information necessary to program the unit. Persons interested in the complete ANSI standard may obtain copies by writing to:

Sales Department
American National Standards Institute
1430 Broadway
New York, New York 10018

All commands begin with ESCAPE (1BH) which terminates any previously started but incomplete Command Sequence. The subsequent characters which are part of the command are not displayed. Display resumes after a complete command has been assembled. There are two basic command forms:

1. The first form consists of one or two characters other than "[" which follow ESC and uniquely define a command. Within the set of valid Escape Sequences, the value of the first character unambiguously indicates whether a subsequent final character is required to complete command, or whether the first character is the final character of the command sequence.

   Examples: A) Command: NEXT LINE

ESC	E	1BH, 45H
Escape Character	Final Character	Hexadecimal Representation

   B) Command: DOUBLE WIDE LINE

ESC	#	6	1BH, 23H, 36H
Escape Character	Intermediate Character	Final Character	Hexadecimal Representation

2. In the second command form, ESC is followed by "[". The character pair is called the "Control Sequence Introducer, CSI". Following the CSI are 0 or more parameters separated by semicolons and terminated by a final character. For the unit, the parameters consist of decimal numbers formed by strings of 0 or more ASCII digits and the final character is alphabetic. The parameters may be "selective" or "numeric".

SELECTIVE PARAMETERS (Ps) are used to select individual subfunctions within a selected list and must be chosen from a limited set appropriate for the command. NUMERIC PARAMETERS (Pn) explicitly represent a number and are valid within the range Ø to 249.

Examples: A) COMMAND: Move the active (cursor) position to the right 15 places.

ESC [	15	C	1BH, 5BH, 31H, 35H, 43H
CSI	PN	Final Character	Hexadecimal Representation

B) COMMAND: Clear lamps 1-4; illuminate lamps 1 and 3.

	Deliminiter			
ESC [	Ø;1;3	q	1BH, 5BH, 3ØH, 3BH, 31H, 3BH, 33H, 71H	
CSI	Ps	Final Character	Hexadecimal Representation	

In general, a control sequence with several selective parameters is functionally equivalent to several control sequences, each with one selective parameter. The same results as the control sequence of examble B) above could be accomplished by:

ESC[ØqESC[1qESC[3q

or: ESC[;1;ØØ3q

or: ESC[qESC[1;3q

The following section describes each escape sequence valid for the unit in ANSI mode. A summary is presented in Section 2.9.1.

2.7 ANSI CONTROL SEQUENCES

2.7.1 CURSOR POSITION REPORT
ESC[Pn;PnR

This sequence reports the active (cursor) position of the unit to the host by means of two numeric parameters (Pn), the first specifying the line and the second specifying the column.

The numbering of lines depends on the state of the Origin Mode.

This CONTROL sequence is solicited by a Device Status Report sent from the host. (See Section 2.7.8.)

2.7.2 CURSOR BACKWARD
ESC[PnD

This sequence moves the active (cursor) position to the left as determined by the numeric parameter. I.e., if the value represented by the parameter value is N, the cursor is moved N spaces to the left; if zero or 1, the cursor is moved one space to the left. When attempting to move the cursor beyond the left margin, the cursor stops at the left margin.

2.7.3 CURSOR DOWN
ESC[PnB

This sequence moves the active (cursor) position downward without altering the column position. The distance moved is determined by the numeric parameter; i.e., if the parameter value is N, the cursor is moved N lines downward, if zero or 1, the cursor is moved one line downward. When attempting to move the cursor below the bottom margin, the cursor stops at the bottom margin.

2.7.4 CURSOR FORWARD
ESC[PnC

This sequence moves the active (cursor) position to the right as determined by the numeric parameter. I.e., if the parameter value is N, the cursor is moved N spaces to the right, if zero or 1, the cursor is moved one space to the right. When attempting to move the cursor to the right of the right margin, the cursor stops at the right margin.

2.7.5 CURSOR POSITION
ESC[Pn;PnH

This sequence moves the active (cursor) position to the position determined by two parameter values, the first specifying the line position and the second specifying the column position. A value of zero or 1 in the first parameter places the cursor in the first line; a value of zero or 1 in the second parameter places the cursor in the first column. Similarly, a parameter sequence of 15;1Ø will move the cursor to line 15, column 1Ø. The default condition, with no parameters present, e.g. ESC[H, is equivalent to a HOME command, and the cursor will move to the top left corner of the screen, or line Ø, column Ø.

The numbering of lines depends on the state of the Origin Mode. See 2.7.28.

2.7.6 CURSOR UP
ESC[PnA

This sequence moves the active (cursor) position upward without altering the column position. The distance moved is determined by the numeric parameter; i.e., if the parameter value is N, the cursor is moved N lines upward, if zero or 1, the cursor is moved one line upward. When attempting to move the cursor above the top margin, the cursor stops at the top margin.

2.7.7 DEVICE ATTRIBUTES
ESC[Pnc

1. A CONTROL sequence with either no parameters or a parameter of Ø is sent by the host to the unit requesting the unit to identify itself.

2. The unit response to this request is as follows:

IDENTIFICATION	RESPONSE TO HOST
unit No Options	ESC[?1;2c or ESC[?1;1c

2.7.8 DEVICE STATUS REPORT
ESC[PsR

The general status of the unit is requested and reported according to the following selective parameter (Ps):

PARAMETER	PARAMETER MEANING
Ø	Response from unit—Ready, No malfunctions detected (default).
3	Response from unit —Malfunction—retry
5	Command from host—Please report status (using a DSR control sequence)

A DSR with a parameter value of Ø or 3 is always sent as a response to a DSR from the host with a parameter value of 5.

6	Command from host—Please report active position (using a CPR control sequence). (See Section 2.7.1)

2.7.9 ERASE IN DISPLAY
ESC[PsJ

This sequence erases some or all of the characters in the display as determined by the parameter. Any complete line erased by this sequence will return that line to single width mode.

PARAMETER	PARAMETER MEANING
Ø	Erase from cursor position to the end of the screen (default)
1	Erase from the start of the screen to and including the cursor position
2	Erase all of the display—all the lines are erased and changed to single-width. The cursor does not move.

2.7.10 ERASE IN LINE
ESC[PsK

This sequence erases some or all of the characters in the active line as determined by the parameter.

PARAMETER	PARAMETER MEANING
Ø	Erase from the cursor position to the end of the line, inclusive (default).
1	Erase from the start of the line to and including the cursor position.
2	Erase all of the line.

2.7.11 HORIZONTAL TABULATION SET
ESC H

This sequence sets one horizontal stop at the cursor column position.

2.7.12 HORIZONTAL AND VERTICAL POSITION
ESC[Pn;Pnf

This sequence moves the active (cursor) position to the position determined by two parameter values, the first specifying the line position and the second specifying the column position. A value of zero or 1 in the first parameter places the cursor in the first line; a value of zero or 1 in the second parameter places the cursor in the first column. Similarly, a parameter sequence of 15;10 will move the cursor to line 15, column 10. The default condition, with no parameters present, e.g. ESC[f, moves the cursor to the HOME position. The numbering of lines and columns depends on the reset or set state of the Origin Mode. See 2.7.28.

2.7.13 INDEX
ESC D

This sequence causes the cursor to move downward one line without changing the column position. If the cursor is at the bottom margin, a scroll up is performed.

2.7.14 LINE FEED/NEW LINE MODE
Set Mode:ESC[20h
Reset Mode:ESC[20l

The Reset Mode control sequence, e.g. ESC[20l, causes the cursor to move vertically, and the RETURN key (CR) to send the single code CR. The Set Mode control sequence, e.g. ESC[20h, causes the cursor to move to the first position of the following line, and causes the RETURN key to send the two codes (CR,LF). The state of this option upon power up is determined by a "switch" setting. See Section 1.6.3.

2.7.15 NEXT LINE
ESC E

This sequence causes the active position to move to the first position on the next line downward. If the active position is at the bottom margin, a scroll up is performed.

2.7.16 SCREEN ALIGNMENT DISPLAY
ESC#8

The command fills the entire screen area with uppercase E's for screen focus and alignment. This command is used by Micro-Term manufacturing personnel.

2.7.17 ANSI/VT52 MODE
Set Mode: N/A
Reset Mode: ESC[?2l

The Reset Mode control sequence, e.g., ESC[?2l, causes only VT52 compatible escape sequences to be interpreted and executed. The Set Mode control sequence causes only ANSI "compatible" escape and control sequences to be interpreted and executed. See Section 2.8.15.

2.7.18 AUTO REPEAT MODE
Set Mode: ESC[?8h
Reset Mode: ESC[?8l

The Set Mode control sequence allows certain keyboard keys to auto-repeat. The Reset Mode control sequence causes no keyboard keys to auto-repeat.

2.7.19 AUTOWRAP MODE
Set Mode: ESC[?7h
Reset Mode: ESC[?7l

The Set Mode control sequence, e.g., ESC[?7h, cause any displayable characters received when the cursor is at the right margin to advance to the start of the next line, performing a scroll up if required and permitted. The Reset Mode control sequence, e.g., ESC[?7l, cause these characters to overwrite any previous characters at the right margin without advancing the cursor.

2.7.20 CURSOR KEYS MODE
Set Mode: ESC[?1h
Reset Mode: ESC[?1l

This mode is only effective when the terminal is in keypad application mode and the ANSI/VT52 mode is set. Under these conditions, the Set Mode control sequence will cause the four cursor function keys to send application functions. The Reset Mode control sequence will cause the four cursor function keys to send ANSI cursor control commands. See Section 2.1.5.

2.7.21 COLUMN MODE
Set Mode: ESC[?3h
Reset Mode: ESC[?3l

The Set Mode control sequence will allow a maximum of 132 columns on the screen. The Reset Mode control sequence will allow a maximum of 80 columns on the screen.

2.7.22 DOUBLE HEIGHT LINE
Top Half: ESC#3
Bottom Half: ESC#4

The line containing the cursor becomes the top or bottom half of a double-height, double-width line, as determined by the control sequences. In order to insure full double-height characters, the control sequences must be used in pairs on adjacent lines, and the same character output must be sent to both lines. If the line was single-width, single-height, all characters to the right of the center of the screen are lost. If the cursor is located to the left of the center screen, it will remain in the same character position; if the cursor is to the right of the center screen, it is moved to the right margin.

2.7.23 DOUBLE-WIDTH LINE
ESC#6

This sequence causes the line that contains the cursor to become double-width, single-height. If the line was single-width, single-height, all characters to the right of the center of the screen are lost. If the cursor is located to the left of the center screen, it will remain in the same character position; if the cursor is to the right of the center screen, it is moved to the right margin.

2.7.24 IDENTIFY TERMINAL
ESC Z

This sequence causes the same response as the ANSI DEVICE ATTRIBUTES. This sequence will not be supported in future terminals, therefore the ANSI device attributes command sequence should be used by any new software.

2.7.25 KEYPAD APPLICATION MODE
ESC =

The auxiliary keypad keys and cursor control keys will transmit control sequences as defined in Sections 2.1.5 and 2.1.6.

2.7.26 KEYPAD NUMERIC MODE
ESC >

The auxiliary keypad keys will send ASCII codes corresponding to the characters on the keys. The cursor control keys will send cursor controls.

2.7.27 LOAD LEDS
ESC[Psq

Load the four programmable LED's on the keyboard according to the selective parameter(s).

PARAMETER	PARAMETER MEANING
Ø	Clear LED's L1 through L4
1	Light L1
2	Light L2
3	Light L3
4	Light L4

The LED numbers are indicated on the keyboard.

For example: If the programmer wishes to light L1 and L3, the following sequence should be used: ESC[1;3q. To then extinguish L1 and L3, and light only L2, use the following: ESC[Ø;2q.

2.7.28 ORIGIN MODE
Set Mode: ESC[?6h
Reset Mode: ESC[?6l

The Set Mode control sequence, e.g., ESC[?6h, causes the origin (home) to be at the upper left character position within the margins. Refer to SET TOP AND BOTTOM MARGINS. Once margins have been defined, the line and column numbers are relative to those margin settings. The cursor is not allowed to be positioned outside the margins.

The Reset Mode control sequence, e.g., ESC[?6l, causes the origin (home) to be at the upper-left character position on the screen (column 1, line 1). If margins have been set (refer to SET TOP AND BOTTOM MARGINS), the line and column numbers are independent of these settings. The cursor may be positioned outside the margins with a cursor position or horizontal and vertical position control.

The cursor is moved to the new home position when this mode is set or reset.

Lines and columns are numbered consecutively, with the origin (home) being line 1, column 1 (upper left character position).

2.7.29 RESTORE CURSOR
ESC 8

This sequence causes the previously saved cursor position, graphic rendition, and character set to be restored. Refer to SAVE CURSOR.

2.7.30 SAVE CURSOR
ESC 7

This sequence causes the cursor position, graphic rendition, and character set to be saved. Refer to RESTORE CURSOR.

2.7.31 SCROLLING MODE
Set Mode: ESC[?4h
Reset Mode: ESC[?4l

The Set Mode control sequence, e.g., ESC[?4h, causes the scroll to be "smooth" at a maximum rate of six or twelve lines per second (see Section 1.11.4). The Reset Mode control sequence, e.g. ESC[?4l, causes the scroll to "jump" instantaneously.

2.7.32 SCREEN MODE
Set Mode: ESC[?5h
Reset Mode: ESC[?5l

The Set Mode control sequence, e.g., ESC[?5h, causes the screen to be white with black characters. The Reset Mode, e.g., ESC[?5l, causes the screen to be black with white characters.

2.7.33 SET TOP AND BOTTOM MARGINS
ESC[Pn;Pnr

This control sequence selects the top and bottom margins to define the scrolling region. The first numeric parameter in the control sequence refers to the first line in the scrolling region; the second numeric parameter refers to the bottom line in the scrolling region. Default is the entire screen, i.e., no margins-- the entire screen will scroll. The minimum size of the scrolling region allowed is two lines, i.e., the top margin (line number) must be less than the bottom margin (line number). The cursor is placed in the home position. Refer to ORIGIN MODE.

2.7.34 SINGLE-WIDTH LINE
ESC#5

This control sequence causes the line containing the cursor to become single-width, single-height. The cursor remains at the same character position. This is the default condition for all new lines on the

screen.

2.7.35 REVERSE INDEX
ESC M

This control sequence causes the cursor to move to the same horizontal position on the preceding line. If the cursor position is at the top margin, a scroll down is performed.

2.7.36 RESET TO INITIAL STATE
ESC c

This control sequence resets the unit to its initial state, i.e. the state it has after it is powered on. This sequence also causes the execution of the power-up self-test.

2.7.37 RESET MODE
ESC[?Ps;Ps;...;Psl

This control sequence resets one or more private unit modes as defined by each selective parameter in the parameter string. Each mode to be reset is specified by a separate parameter. Refer to SET MODE.

2.7.38 SET MODE
ESC[?Ps;...;Psh

This control sequence sets one or more private unit modes as defined by each selective parameter in the parameter string. Each mode to be set is specified by a separate parameter. A mode is considered set until it is reset by a Reset Mode control sequence. Refer to RESET MODE.

PARAMETER	MODE FUNCTION	"SET"	"RESET"
1	Cursor Key	Application	Cursor
2	ANSI/VT52	ANSI	VT52
3	Column	132	80
4	Scrolling	Smooth	Jump
5	Screen	Reverse	Normal
6	Origin	Relative	Absolute
7	Auto Wrap	Enabled	Disabled
8	Auto Repeat	Enabled	Disabled
31	2 pages (80 Col)	Enabled	Disabled

All other parameters are ignored.

2.7.39 SELECT CHARACTER SET

The appropriate GØ and Gl character sets are designated from one of the five possible character sets. The GØ character set is enabled by the code SI (ØFH), while the Gl character set is enabled by the control code SO (ØEH).

GØ SETS SEQUENCE	Gl SETS SEQUENCE	MEANING
ESC(A	ESC)A	United Kingdom Set
ESC(B	ESC)B	ASCII Set
ESC(Ø	ESC)Ø	Special Graphics
ESC(1	ESC)1	Alternate Character ROM Standard Character Set
ESC(2	ESC)2	Alternate Character ROM Special Graphics

The United Kingdom and ASCII sets conform to the "ISO international register of character sets to be used with escape sequences". The other sets are private character sets. Special Graphics means that the graphic characters for the codes 6F Hex to 7E Hex are replaced with other characters (see Table 2.3.1). When a specified character set is enabled through the use of the Select Character Set codes SI or SO, that character set will be used until another Select Character Code (SI or SO) the "restore cursor" (2.7.31) command is received, or the operator chooses another page (see Section 1.3.11).

2.7.40 SELECT GRAPHIC RENDITION

ESC[Ps;...Psm

This control sequence enables the graphic rendition as specified by the parameter(s). All characters transmitted to the unit following the control sequence are rendered according to the specified parameter(s) until the next occurrence of a Select Graphic Rendition control sequence.

PARAMETER	PARAMETER MEANING
Ø	Attribute Off (Default)
1	Bold or Increased intensity
4	Underscore
5	Blink
7	Negative (reverse) image

All other parameter values are ignored.

2.7.41 TABULATION CLEAR
ESC[Psg

This control code sequence causes tabs to be cleared as specified by the numeric parameter. Default value is Ø.

PARAMETER	PARAMETER MEANING
Ø	Clear the horizontal tab stop at the active column position.
3	Clear all horizontal tab stops.

All other parameter values are ignored.

2.7.42 TWO PAGE OPERATION
Set Mode: ESC[?31h
Reset Mode: ESC[?31l

The Set Mode control sequence allows the "select page 1" and "select page 2" (2.7.70) commands to operate when in 80 column mode. When reset, the commands are ignored.

2.7.50 ANSI MODE EDITING COMMANDS

2.7.51 DELETE CHARACTER
ESC[PnP

Pn characters on a single line are deleted, beginning with the character at the current cursor position. Undeleted characters to the right of the cursor are moved to the left to occupy the deleted character space.

2.7.52 DELETE LINE
ESC[PnM

Pn lines are deleted from the display beginning with the line containing the cursor. Only lines within the scrolling region can be deleted. Undeleted lines below the cursor are moved up to occupy the deleted row space. Each row of the resulting space at the bottom of the window takes on the graphic rendition (video attributes) of bottom row of the window.

2.7.53 INSERT LINE
ESC[PnL

Pn lines are inserted before the row containing the cursor. Only lines within the scrolling region can be affected. The cursor line and those which are below it and within the window are moved down to create the

space for the inserted lines which take on the video attributes of the cursor line.

2.7.54 INSERTION/REPLACEMENT MODE

Enter Insertion Mode: ESC[4h
Exit Insertion Mode: ESC[4l

The control sequence causes the unit to enter the insertion mode and illuminate L3 on the keyboard LEDs. While the insertion mode is active, all received characters are placed at the cursor position, all characters from the cursor to the right margin are shifted to the right by one character, and the rightmost character is lost. The Exit sequence causes L3 to be extinguished and all received characters to overwrite the preexisting character at the cursor position. This mode is also called replacement mode and is the normal mode of operation upon power up of the unit.

2.7.60 ANSI MODE PRINTER OPERATION

There are 2 print modes and 2 print commands. If either mode is entered, it must be terminated before selecting another mode or issuing a print command. Any non-displayable characters (special graphics) are converted to spaces before transmission to the printer. Trailing spaces are not transmitted and transmission of each line ends with CR (ØDH) and LF (ØAH). Double height rows are transmitted as two identical single height rows. Double width rows are transmitted as single width. The printer may control data transmitted from the unit by lowering DTR (pin 2Ø) or sending XOFF. Transmission to the printer is resumed when DTR becomes high or XON is received from the printer.

2.7.61 AUTO PRINT MODE

Enter: ESC[?5i
Terminate: ESC[?4i

Auto-print mode may be initiated or terminated by the operator by depressing "CONTROL ENTER/PRINT" or by the host with the listed control sequences. While in the auto-print mode, the unit transmits the contents of the cursor line to the printer whenever a linefeed function is performed.

2.7.62 PRINTER CONTROLLER MODE

Initiate: ESC[5i
Terminate: ESC[4i

Printer controller mode causes all data received by the unit to be sent to the printer without being displayed. If no printer is attached or the printer is not ready and was not ready when the unit was powered up, data destined for the printer is displayed. No characters of the command to exit printer controller mode are passed to the printer.

2.7.63 PRINT LINE
ESC[?1i

The line containing the cursor is passed to the printer.

2.7.64 PRINT PAGE
ESC[i

Data representing the entire page is sent to the printer upon receipt of this command. The page may consist of the entire display or be restricted to the scrolling region (see Sections 1.9.4, 2.7.65). A formfeed code will follow the page data if selected (see Sections 1.9.3, 2.7.66).

2.7.65 PRINT EXTENT
Set: ESC[19h (Full Screen)
Reset: ESC[19l (Scrolling Window)

When the print extent mode is set, all characters of the display are transmitted during the execution of a page print command. With the print extent mode reset, only the characters within the scrolling window are transmitted.

2.7.66 PRINT TERMINATION CHARACTER MODE
Set: ESC[18h (Form Feed)
Reset: ESC[18l (None)

With the print termination character mode set, a form feed (ØCH) is added to the end of the data destined for the printer in response to a "print page" command. When the mode is reset, no extra characters are transmitted.

2.7.67 PRINTER STATUS REPORT

Before issuing a print command, the host may request a report from the unit to verify that the printer is operational. Verification of the printer status minimizes the risk that an inoperable printer will cause the unit to send XOFF to the host and suspend processing of new data until the printer becomes operable.

FUNCTION	REQUEST/RESPONSE SEQUENCE
Host requests printer status	ESC[?15n
Response: Printer ready	ESC[?10n
Response: Printer temporarily not ready (DTR low now, but was high during power up tests)	ESC[?11n
Response: No printer (DTR is low and was low during power up tests)	ESC[?13n

2.7.70 PAGE SELECTION

When in 80 column mode and with 2 page operation enabled (2.7.38), the host can select either of 2 pages for display. Each page maintains its own cursor position and character set definitions. Changing between 80 and 132 column mode erases both pages and forces page 1 to be selected when 80 column mode is restored.

2.7.71 SELECT PAGE 1
ESC[V

Selects page 1 when in 80 column mode and 2 page operation is enabled.

2.7.72 SELECT PAGE 2
ESC[U

Selects page 2 when in 80 column mode and 2 page operation is enabled.

2.8 VT52 CONTROL SEQUENCES

2.8.1 CURSOR UP
ESC A

This control code sequence moves the cursor upward one position without altering the horizontal position. When attempting to move the cursor above the top margin, the cursor stops at the top margin.

2.8.2 CURSOR DOWN
ESC B

This control code sequence moves the cursor downward one position without altering the horizontal position. When attempting to move the cursor below the bottom margin, the cursor stops at the bottom margin.

2.8.3 CURSOR RIGHT
ESC C

This control code sequence moves the cursor to the right. When attempting to move the cursor to the right of the right margin, the cursor will stop at the right margin.

2.8.4 CURSOR LEFT
ESC D

This control code sequence moves the cursor the the left. When attempting to move the cursor beyond the left margin, the cursor will stop at the left margin.

2.8.5 ENTER GRAPHICS MODE
ESC F

This control sequence enables the special graphics character set to be used.

2.8.6 EXIT GRAPHICS MODE
ESC G

This control sequence enables the standard ASCII character set to be used.

2.8.7 CURSOR TO HOME
ESC H

This control sequence moves the cursor to the home (upper left) position.

2.8.8 REVERSE LINE FEED
ESC I

This control sequence moves the cursor upward one position without altering the column position. If the cursor is at the top margin, a scroll down is performed.

2.8.9 ERASE TO END OF SCREEN
ESC J

This control sequence causes all characters from the cursor position to the end of the screen to be erased. The cursor position is not changed.

2.8.10 ERASE TO END OF LINE
ESC K

This control sequence causes all characters from the cursor position to the end of the current line to be erased. The cursor position is not changed.

2.8.11 DIRECT CURSOR ADDRESS
ESC Y line column

This control sequence causes the cursor to be moved to the specified line and column. The line and column numbers are sent as ASCII codes whose values are the number plus 1F Hex; e.g., 20 Hex refers to the first line or column, 2F Hex refers to the sixteenth line or column, etc.

2.8.12 IDENTIFY
ESC Z

This control sequence causes the terminal to send its identifier escape sequence to the host.

2.8.13 ENTER ALTERNATE KEYPAD MODE
ESC=

This control sequence enables the auxiliary keypad keys to send unique identifiable escape sequences for use by applications programs.

2.8.14 EXIT ALTERNATE KEYPAD MODE
ESC>

This control sequence enables the auxiliary keypad keys to send the ASCII codes for the function or characters engraved on the key.

2.8.15 ENTER ANSI MODE
ESC<

This control sequence causes all subsequent escape sequences to be interpreted according to ANSI Standards X3.64-1977 and X3.41-1974 (see Section 2.7). The VT-52 escape sequences designated in this section will not be recognized.

2.8.16 PRINTER PORT

The unit supports six commands to control the printer port in VT52 mode.

ESC V:	print the line containing the cursor
ESC]:	print the screen
ESC W:	enter printer controller mode
ESC X:	exit printer controller mode
ESC ^:	enter auto print mode
ESC _ :	exit auto print mode.

2.8.17 PRINTER MODE DESCRIPTIONS:
PRINTER CONTROLLER MODE

When printer controller mode is enabled, all future characters received by the unit except XON and XOFF are passed directly to the printer until the command to exit printer controller mode is received. The exit sequence, "ESC X", is not passed to the printer but instead causes the terminal to exit the printer controller mode.

2.8.18 AUTO-PRINT MODE

When the auto print mode is enabled, receipt of the line feed code by the unit causes the row containing the cursor to be marked for printing. In this mode, data on the display can be automatically printed without necessarily degrading terminal response time to the operator.

2.8.19 PRINTER HANDSHAKING

The printer can suspend transmission from the unit to the printer by either lowering DTR (see 3.1.3) or sending XOFF to the unit. Transmission to the printer resumes when an XON is received from the printer (if XOFF had previously been sent) and DTR is high. The processes of printing and communicating with the host are managed independently by the unit, allowing different data rates to be used on the two channels without interference. If the printer is used at a slower speed than the I/O channel, auto XON - XOFF must be used and supported by the host.

2.9 CONTROL SEQUENCE SUMMARY

2.9.1 ANSI MODE CONTROL SEQUENCES SUMMARY

CURSOR MOVEMENT

Cursor Up	ESC[PnA	
Cursor Down	ESC[PnB	
Cursor Forward (right)	ESC[PnC	
Cursor Backward (left)	ESC[PnD	
Direct Cursor Addressing	ESC[Pl;PcH	(Pl=line #)
or	ESC[Pl;Pcf	(Pc=column #)
Index	ESC D	
New Line	ESC E	
Reverse Index	ESC M	
Save Cursor and Attributes	ESC 7	
Restore Cursor and Attributes	ESC 8	

ERASING

From Cursor to End of Line	ESC[K or ESC[ØK
From Beginning of Line to Cursor	ESC[1K
Entire Line Containing Cursor	ESC[2K
From Cursor to End of Screen	ESC[J or ESC[ØJ
From Beginning of Screen to Cursor	ESC[1J
Entire Screen	ESC[2J

CHARACTER LINE SIZE

Change this line to double-height top half	ESC#3
Change this line to double-height bottom half	ESC#4
Change this line to single-width single-height	ESC#5
Change this line to double-width single-height	ESC#6

8Ø COLUMN PAGE SELECTION

Select page Ø	ESC[V
Select page 1	ESC[U

These commands will be ignored unltss 8Ø column mode and 2 page mode are selected (see 2.7.38).

CHARACTER ATTRIBUTES
ESC[Ps;Ps;Ps;....;Ps m

Ps refers to a selective parameter. Multiple parameters are separated by the semicolon character (3BH). The parameters are executed in order and have the following meanings:

Ø or None	All Attributes Off
1	Bold on
4	Underscore On
5	Blink On
7	Reverse Video On

CHARACTER SETS

CHARACTER SET	GØ DESIGNATOR	Gl DESIGNATOR
United Kingdom (UK)	ESC(A	ESC)A
United States (USASCII)	ESC(B	ESC)B
Special Graphics Characters and Line Drawing Set	ESC(Ø	ESC)Ø
Alternate Character ROM	ESC(1	ESC)1
Alternate Character ROM Special Graphics Characters	ESC(2	ESC)2

SCROLLING REGION
ESC[Pt;Pb r

Pt is the number of the top line of the scrolling region; Pb is the number of the bottom line of the scrolling region and must be greater than Pt.

TAB STOPS:

Set tab at current column	ESC H
Clear tab at current column	ESC[g or ESC[Øg
Clear all tabs	ESC[3g

PROGRAMMABLE LEDS
ESC[Ps;Ps;...Ps q

Ps are selective parameters separated by semicolons (3BH) and executed in order, as follows:

Ø or None	All LEDs Off
1	Ll On
2	L2 On
3	L3 On
4	L4 On

MODES

MODE NAME	TO SET MODE	TO SET SEQUENCE	TO RESET MODE	TO RESET SEQUENCE
Insertion/Replacement	Insertion	ESC[4h	Replacement	ESC[4l
Print termination	Form feed	ESC[18h	None	ESC[18l
Print extent	Full page	ESC[19h	Window	ESC[19l
Line feed/new line	NEW line	ESC[20h	Line feed	ESC[20l
Cursor key mode	Application	ESC[?1h	Cursor	ESC[?1l
ANSI/VT52 mode	ANSI	N/A	VT52	ESC[?2l
Column mode	132 Col	ESC[?3h	80 Col	ESC[?3l
Scrolling mode	Smooth	ESC[?4h	Jump	ESC[?4l
Screen mode	Reverse	ESC[?5h	Normal	ESC[?5l
Origin mode	Relative	ESC]?6h	Absolute	ESC[?6l
Wraparound	On	ESC[?7h	Off	ESC[?7l
Auto repeat	On	ESC[?8h	Off	ESC[?8l
2 page mode	On	ESC[?31h	Off	ESC[?31l
Keypad mode	Application	ESC =	Numeric	ESC[>

REPORTS

Cursor Position Report

Invoked by	ESC[6n
Response is	ESC[Pl;PcR Pl = Line; Pc = Column

Printer Status Report

Invoked by	ESC[?15n
Response: Ready	ESC[?10n
Temporarily Not Ready	ESC[?11n
No Printer	ESC[?13n

Status Report

Invoked by	ESC[5n
Response is	ESC[0n (terminal OK)
	ESC[3n (terminal not OK)

What Are You

Invoked by	ESC[c or
	ESC[0c
Response is	ESC[?1;2c

RESET

Reset causes the power-up reset routine to be executed.

ESC c

CONFIDENCE TESTS

Fill Screen with "Es"	ESC#8
Invoke Tests	ESC[2;9y

Tests exercise ROM. RAM, and EAROM. Tests are repeated indefinitely until failure or power off.

EDITING

Insertion mode: Enter	ESC[4h
Exit (replacement mode)	ESC[4l
Delete character	ESC[PnP
Delete line	ESC[PnM
Insert line	ESC[PnL

PRINTING

Auto print mode: Enter	ESC[?5i
Exit	ESC[?4i
Printer controller mode: Enter	ESC[5i
Exit	ESC[4i
Print line	ESC[?1i
Print page	ESC[i

2.9.2 VT52 MODE CONTROL SEQUENCES SUMMARY

Cursor Up	ESC A
Cursor Down	ESC B
Cursor Right	ESC C
Cursor Left	ESC D
Select Special Graphics Character Set	ESC F
Select ASCII Character Set	ESC G
Cursor to Home	ESC H
Reverse Line Feed	ESC I
Erase to End of Screen	ESC J

Erase to End of Line	ESC K
Direct Cursor Address	ESC Y line column
Identify	ESC Z
Enter Alternate keypad Mode	ESC =
Exit Alternate Keypad Mode	ESC >
Enter ANSI Mode	ESC <
PRINTER COMMANDS	
Enter Printer Controller Mode	ESC W
Exit Printer Controller Mode	ESC X
Enter Auto Print Mode	ESC ^
Exit Auto Print Mode	ESC _
Print Line	ESC V
Print Page	ESC]

SECTION 3.Ø APPENDICES

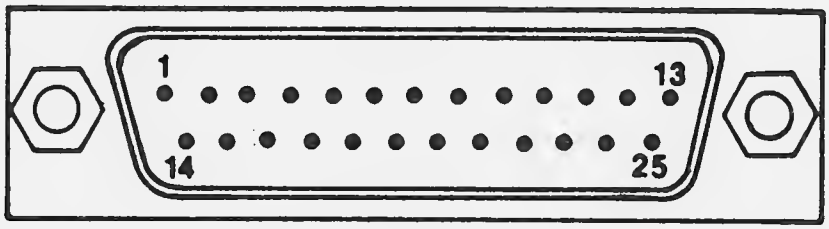
3.1 EXTERNAL INTERFACES

3.1.1 POWER/ENVIRONMENT

The unit was factory set to operate at 115v. or 22Øv. ± 1Ø% 5Ø/6Ø Hz. The ambient temperature must be within the range of 5 - 4Ø degrees C.

3.1.2 25 PIN EIA CONNECTOR TO HOST

The Data Terminal Ready line (pin 2Ø of the I/O connector) is normally asserted whenever the unit is powered up. However, DTR may be forced low for the duration of the long break (modem disconnect) signal by typing SHIFT BREAK.



PIN		
1	Protective ground	Common
2	Serial Out (data)	From unit
3	Serial In (data)	To unit
4	Request to Send (out)	Asserted whenever the unit is on
5	Clear To Send (in)	Unused in full duplex
6	Data Set Ready (in)	Unused in full duplex
7	Signal Ground	Common
2Ø	Data Terminal Ready (out)	Normally asserted whenever the unit is on, except during long "Break".

All signal levels at the 25 pin I/O connector must conform to EIA STD RS-232-C. Signals originating from the unit conform to this standard when properly loaded. In particular, the "mark", "low", "off", or "unasserted" state exists when the level at the appropriate pin is in the range -3 to -25v. The "space", "high", "on", or "asserted" state exists when the voltage is +3 to +25v. referenced to pin 7.

The minimum interface for bidirectional data transfer consists of the interconnecting pins 2,3 and 7 between the unit and the host. All unconnected input control lines on the I/O connector assume the unasserted state.

CURRENT LOOP

The unit may be converted to a Current Loop interface by purchasing a current loop adapter from Micro-Term or your local Micro-Term distributor. This adaptor plugs into the RS232 (I/O) port and is housed in a plastic case approximately 4"x2"xl 1/2". Instructions for installation are provided with the device.

3.1.3 CONNECTOR TO PRINTER

1	protective ground	Common
2	serial in (XON,XOFF)	To unit
3	serial out (data)	From unit
7	signal ground	Common
*	Data Terminal Ready (In)	Disables transmissions from unit when not asserted.

Pin 2Ø assumes the unasserted state at the unit if not connected. Printer port operation can be verified by the use of "printer test mode" (1.9.2). XON/XOFF transmission and DTR level from the printer can be verified in "diagnostic mode" (1.11.2).

3.1.4 VIDEO OUT

A composite video signal representing the screen display is available through the video output connector at the rear of the unit. In general, satisfactory reproduction of the display will not be obtained with the common type of closed circuit TV monitor since overscan will occur.

Accurate display reproduction is obtained by using a "data display" type of monitor.

OUTPUT IMPEDANCE:	75 ohms, dc coupled
SYNC LEVEL:	Ø.Ø V.
BLACK LEVEL	~.5 V.
WHITE LEVEL:	~1.5 V.

3.2 IN CASE OF DIFFICULTY...

3.2.1 SELF TEST ERROR CODES

After power up, or whenever the self tests are performed, a single digit error code will be displayed in the upper left hand corner of the display if any of the tests are not successfully passed. The significance of the error digits are summarized below.

1. Display Memory Failure At least one of the 48 thousand bits of display memory is not properly accessible. Depending upon the degree of disfunction, the effect of the memory failure may not otherwise be immediately apparent to the user.

2. EAROM Failure The integrity of the data retrieved from the EAROM can not be verified. A set of default values are used in place of the EAROM data to "set up" the unit. The set up features must be verified and corrected for the user's application.

3. Display Memory and EAROM Failure

4. ROM Checksum Failure: The internal program memory cannot be verified.

5. ROM and Display Failure

6. ROM and EAROM Failure

7. ROM, EAROM, and Display Failure

If, after power up, there is no display or an improper display and the "keyboard locked", L1, L2, L3, and L4 LEDs are all on, then there has been a failure of the internal processor RAM and the terminal must be repaired. All other detected errors are non-fatal in that the user may proceed at risk to use the terminal, but a processor RAM error will immediately cause the terminal to suspend operation.

3.2.2 TROUBLESHOOTING SUGGESTIONS

A) Keyboard Locked Verify that the host sends XON after XOFF to reenable transmission from the unit.

B) Checkboard Character(s) On Display Verify the I/O interface including signal levels, speeds, number of data bits, and parity at both the unit and the host.

C) 5 Bells Upon Power-Up Hardware failure. Refer to Section 3.2.1.

D) No Communication To/From Host Verify the I/O connections in 3.1.2. Verify data rates and word format. Be sure that transmission from either the host or the unit has not been suspended due to receipt of "XOFF"; check using "diagnostic mode" (1.11.2). Verify keyboard operation in LOCAL mode. Verify that a print operation has not been suspended indefinitely; check using "diagnostic mode" (1.11.2).

E) Blank Display Be sure that the unit is turned on and connected to the proper source. Depress any key to reset the "tube saver" feature which will blank the display after 8 minutes of inactivity when enabled.

3.3 ASCII CODES

CTRL	Character	Binary	Bit 7 to Bit 0	Octal	Decimal	Hexadecimal
@	NUL	00000000		000	000	00
A	SOH	00000001		001	001	01
B	STX	00000010		002	002	02
C	ETX	00000011		003	003	03
D	EOT	00000100		004	004	04
E	ENQ	00000101		005	005	05
F	ACK	00000110		006	006	06
G	BEL	00000111		007	007	07
H	BS	00001000		010	008	08
I	HT	00001001		011	009	09
J	LF	00001010		012	010	0A
K	VT	00001011		013	011	0B
L	FF	00001100		014	012	0C
M	CR	00001101		015	013	0D
N	SO	00001110		016	014	0E
O	SI	00001111		017	015	0F
P	DLE	00010000		020	016	10
Q	DC1	00010001		021	017	11
R	DC2	00010010		022	018	12
S	DC3	00010011		023	019	13
T	DC4	00010100		024	020	14
U	NAK	00010101		025	021	15
V	SYN	00010110		026	022	16
W	ETB	00010111		027	023	17
X	CAN	00011000		030	024	18
Y	EM	00011001		031	025	19
Z	SUB	00011010		032	026	1A
[	ESC	00011011		033	027	1B
\	FS	00011100		034	028	1C
]	GS	00011101		035	029	1D
^	RS	00011110		036	030	1E
_	US	00011111		037	031	1F
	SP	00100000		040	032	20
	!	00100001		041	033	21
	"	00100010		042	034	22
	#	00100011		043	035	23
	$	00100100		044	036	24
	%	00100101		045	037	25
	&	00100110		046	038	26
	'	00100111		047	039	27
	(	00101000		050	040	28
	)	00101001		051	041	29
	*	00101010		052	042	2A
	+	00101011		053	043	2B
	,	00101100		054	044	2C
	-	00101101		055	045	2D
	.	00101110		056	046	2E
	/	00101111		057	047	2F
	0	00110000		060	048	30
	1	00110001		061	049	31
	2	00110010		062	050	32
	3	00110011		063	051	33
	4	00110100		064	052	34
	5	00110101		065	053	35
	6	00110110		066	054	36
	7	00110111		067	055	37
	8	00111000		070	056	38
	9	00111001		071	057	39
	:	00111010		072	058	3A
	;	00111011		073	059	3B
	<	00111100		074	060	3C
	=	00111101		075	061	3D
	>	00111110		076	062	3E
	?	00111111		077	063	3F
	@	01000000		100	064	40
	A	01000001		101	065	41
	B	01000010		102	066	42
	C	01000011		103	067	43
	D	01000100		104	068	44
	E	01000101		105	069	45
	F	01000110		106	070	46
	G	01000111		107	071	47
	H	01001000		110	072	48
	I	01001001		111	073	49
	J	01001010		112	074	4A
	K	01001011		113	075	4B
	L	01001100		114	076	4C
	M	01001101		115	077	4D
	N	01001110		116	078	4E
	O	01001111		117	079	4F
	P	01010000		120	080	50
	Q	01010001		121	081	51
	R	01010010		122	082	52
	S	01010011		123	083	53
	T	01010100		124	084	54
	U	01010101		125	085	55
	V	01010110		126	086	56
	W	01010111		127	087	57
	X	01011000		130	088	58
	Y	01011001		131	089	59
	Z	01011010		132	090	5A
	[	01011011		133	091	5B
	\	01011100		134	092	5C
	]	01011101		135	093	5D
	^	01011110		136	094	5E
	_	01011111		137	095	5F
	`	01100000		140	096	60
	a	01100001		141	097	61
	b	01100010		142	098	62
	c	01100011		143	099	63
	d	01100100		144	100	64
	e	01100101		145	101	65
	f	01100110		146	102	66
	g	01100111		147	103	67
	h	01101000		150	104	68
	i	01101001		151	105	69
	j	01101010		152	106	6A
	k	01101011		153	107	6B
	l	01101100		154	108	6C
	m	01101101		155	109	6D
	n	01101110		156	110	6E
	o	01101111		157	111	6F
	p	01110000		160	112	70
	q	01110001		161	113	71
	r	01110010		162	114	72
	s	01110011		163	115	73
	t	01110100		164	116	74
	u	01110101		165	117	75
	v	01110110		166	118	76
	w	01110111		167	119	77
	x	01111000		170	120	78
	y	01111001		171	121	79
	z	01111010		172	122	7A
	{	01111011		173	123	7B
	|	01111100		174	124	7C
	}	01111101		175	125	7D
	~	01111110		176	126	7E
	DEL	01111111		177	127	7F

WARRANTY AND SERVICE INFORMATION

(A) The unit requires no maintenance and should perform faithfully for many years. Micro-Term will repair any unit which fails within the original warranty period provided that the terminal has not been abused or modified in any way.

(B) The unit is accompanied by a limited one year warranty. For in-warranty service, the user may elect to return either the defective board or the entire unit to the factory, freight prepaid. Micro-Term will return in-warranty repair freight prepaid for the first ninety days of the warranty period, and freight collect thereafter.

(C) Beyond the warranty period, Micro-Term will charge a nominal fee for the repair of any unit. A complete technical manual, including schematic, theory of operation, and timing diagrams is available for owners of the unit. Any further information relating to the operation or interfacing of your unit can be obtained by writing directly to:

MICRO-TERM, INCORPORATED
512 RUDDER ROAD
FENTON, MO 63026

(D) If you would prefer to have your terminal serviced at your location, a convenient plan is available throughout the continental United States. For one low monthly fee, your terminal will be repaired at your site within one business day of your call for assistance. To begin your service agreement, or for more information on our maintenance plan, please call our marketing department at the below listed number.

MICRO-TERM, INCORPORATED
512 RUDDER ROAD
FENTON, MO 63026
ATTENTION: TECHNICAL PUBLICATIONS STAFF

(314) 343-6515

FCC PART 15 ADDENDUM

WARNING: This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions given below, may cause interference to radio communications. As temporarily permitted by regulation, it has not been tested for compliance with the limits for Class A computing devices pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

INSTALLATION INSTRUCTIONS: This unit is equipped with a line filter to minimize the amount of radio frequency interference radiated onto the power line. For this filter to be effective, the ground prong of the three pronged line cord plug must be properly grounded by a three terminal receptacle. Otherwise, the line filter will not function as designed and unnecessary interference will result.

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